

# **MULTIPLE-ANTENNA PARTIALLY COHERENT CONSTELLATIONS FOR MULTI-CARRIER SYSTEMS**

## **ABSTRACT:**

5 A multi-level space time signal constellation that is optimized for use with a multi-carrier,  
multi-path communication scheme includes points on a first level separated from points on a  
mutually exclusive second level by a minimum distance that is based on a conditional  
probability distribution, preferably a Kullback-Leibler (KL) distance. Points within one level  
may be separated by a Euclidean distance, but spherical levels are rotated relative to one  
10 another to maximize a minimum inter-level KL distance. A receiver uses pilot symbols to  
estimate the channels and two-stage symbol detection, determining in one stage the  
constellation level and in another stage the point in the level. The receiver calculates a  
likelihood function based on a conditional distribution which does not reduce to the  
Euclidean-based nearest-neighbor detector. A single stored constellation may be scaled based  
15 on received signal to noise ratio. Each constellation defines  $n=2M$  real dimensions, wherein  
M is the number of transmit antennas.